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in promoting British trade with Tibet. The resolution is signed by the president, Professor James Geikie.

This part of the course of the Brahmaputra has not been surveyed on account of the hostility of the Mishmi tribes among the mountains. No exploring party has been sufficiently strong to push through this inhospitable country.

GEOGRAPHICAL RECORD.

AFRICA.

THE DUKE OF THE ABRUZZI STARTS FOR AFRICA.—The expedition of the Duke of the Abruzzi to Mount Ruwenzori sailed on April 17. Twelve Europeans are in the party: the Duke of the Abruzzi, Captain Cagni, Dr. Cavalli, Lieut. Winspeare, Dr. Roncati, a geologist, Signor Vittorio Sella, two Alpine guides, two porters, and an assistant photographer.

THE FRENCH CONGO.—A decree issued on Feb. 11, 1906, modifies the territorial divisions of the French Congo (BULLETIN No. 3, 1904, p. 169). The region is divided into four districts—Gabon, Moyen-Congo, Oubangui-Chari, and Tchad—all of which will be under the administrative control of the Commissioner-General residing at Brazzaville. The first three are colonies with financial and administrative autonomy, while the Tchad district is a military territory attached to the Oubangui-Chari. The capitals of the colonies are Libreville, Brazzaville, and Fort de Possel.

The territorial modifications do not greatly affect the division of the area made in 1894, but the Gabun receives some accession of territory by the incorporation of coast districts formerly included in the middle Congo. The Gabun colony now comprises all the basin of the Ogowe, with coast districts from the Spanish territory in the north to Sette Cama in the south. The Chad territory includes practically all the French portion of the Shari basin, together with Wadai and Kanem.

Commissioner-General Gentil has returned to the Congo to carry out the programme of administration formulated by the Colonial Minister. It is designed to guard the natives against ill-treatment, preserve the resources of the country, and rationally develop them.

THE NILE FLOOD AND ITS VARIATION.—Captain H. G. Lyons, Director-General of the Survey Department of Egypt, has been making a study of the Nile floods in relation to pressure conditions and rainfall (see this BULLETIN, Oct., 1905, pp. 601-602). His latest paper is entitled "On the Nile Flood and its Variation" (*Geographical Journal,* Sept.-Oct., 1905), and concerns the possible correlations between Nile floods and other periodic oscillations in solar and meteorological phenomena. Several writers on the Nile have asserted that an alternation of high and low floods is evident, and have sought a relation between this alternation, on the one hand, and sun-spots (Fritz), deficient monsoons in India (Willcocks), solar weather (Lockyer), and Indian pressures and monsoon characteristics

(Eliot), on the other. Captain Lyons has undertaken to determine whether there is a periodical variation in the Nile flood, whether a series of good floods is regularly followed by one of deficient floods, or whether excess and deficiency succeed one another irregularly. The Nile flood represents the run-off of an area over which the East African monsoon rains fall in June, July, August, and September. Hence the variation of this rainfall is the real thing to be studied. The flood is practically independent of the White Nile, and for this reason no attention need be paid to the meteorological conditions and rainfall in that basin for the purposes of the discussion.

Fairly reliable records of the maximum readings of the Nile floods are available for eighty years past, and there does not appear to be any definite relation between the sun-spot curve and either the five-year or the yearly flood-curve. Hence the Abyssinian rainfall, upon which the flood depends, seems clearly to be due to the combined effect of causes which usually prevent any coincidence between high and low floods and the maxima and minima of the sun-spots from being recognized. A prediction of better floods when a sun-spot maximum is approaching seems to Captain Lyons to go further than the evidence warrants. Nor does the Abyssinian rainfall show a direct and simple relation to + and — pulses of the solar weather cycle, as discussed by the Lockyers for India and Mauritius, and suggested also for the Nile floods. Egypt and Abyssinia seem to form an area whose meteorological conditions are not regularly consonant with those of India as discussed by Sir N. Lockyer, agreeing at times and then differing greatly.

A comparison of the Nile flood-curves with the curves of Brückner's climatic cycle shows that the former approaches to some extent the curve which Brückner gives for areas which he classes as "temporary exceptions," but that the normal Brückner cycle cannot apply to Abyssinian rainfall, and no predictions of coming floods can be based on this cycle. In the variation of the Nile from year to year there is no trace of any definite periodicity which could be of assistance in forecasting the probable duration of any succession of high or low Nile floods. There is a short-period fluctuation in the Abyssinian rainfall, but no more or less regular increase for a number of years, and then a decrease. Further, there is not the correlation between the Indian monsoon rainfall and the Nile floods which has often been stated to exist. Captain Lyons finds that, so far as present knowledge goes, the Nile flood depends primarily on the strength of the monsoon air-currents from the Indian Ocean, modified by the pressure conditions over northeastern Africa. R. DeC. W.

SENATE DOCUMENT NO. 104, 59TH CONGRESS, FIRST SESSION, contains copies of papers relating to the claims of Cope Whitehouse to certain desert lands in Egypt, transmitted by President Roosevelt on the 4th of January, in response to the Senate's resolution of December 7, 1905.

These "desert lands" are better known to those who have followed Mr. Whitehouse's career as the Wadi Raiyan or the Raiyan-Moeris, first explored by him*;

the desert depression west of the Nile and South of Cairo, which is to be filled from the Canal of Joseph by sluice-ways eight miles in length.

Among the papers, all interesting to geographers and Egyptologists, is a bibliographical index (pp. 50-51).

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* BULLETIN, 1882, pp. 85–108; 1889, pp. 530–582.

CLIMATE OF SOUTH AFRICA.—F. S. Watermeyer, Government Land Surveyor, in a paper on South Africa south of the Limpopo (*Scot. Geogr. Mag.*, Jan., 1906) summarizes the climatic features of that region. The Portuguese territory along the east coast is well watered. There is abundant grass, forming excellent pasturage for cattle, sheep, and goats. Semi-tropical fruits can be grown, and the staple cereal products are maize, kaffir corn, and rice, kaffir beans, etc. Along the slopes of the Drakenberg, at about 3,000 ft., coffee, tobacco, and citrus fruits—bananas, pines, etc.—grow luxuriously. Semi-tropical plants and fruits grow less abundantly as the latitude increases southwards. The best wheat-producing parts of South Africa (where no irrigation is used) are on the west coast of Cape Colony from the Elephants' River as far as Mossel Bay and a strip of land along the western slopes of the Drakenberg where the rainfall during April, May, and June is sufficient.

Maize, kaffir corn, manna, potatoes, beans, and peas can be grown throughout South Africa by irrigation, and as summer crops wherever the rains extend; semi-tropical fruits on the Low and Middle Veld, and along the eastern slopes of the Drakenberg southwards; peaches at all altitudes to 2,000 feet or over; plums, pears, apples, etc., especially on the High Veld. The zone of maximum rainfall along the eastern and southern slopes of the Drakenberg and the coast ranges on the south as far as Swellendam is marked by belts of forests.

The altitude of the high plateaux of South Africa lowers the temperature considerably. Farther north, in the Middle Veld and low country, and on the east coast, temperatures of 115° to 120° in the shade are reported as of frequent occurrence. From November to April the rains in the north and east keep the air moist and salubrious, although the temperature is often very high. In winter the air is dry, cold, and healthy. In June, in the Bush Veld, temperatures 12° to 22° below freezing (Fahr.) have been registered between 2 and 6 A. M., and by noon the thermometer may stand at 90°. About the equinox, in September, strong winds from southeast or northwest sweep over the country. These gales generally last intermittently from August to October, and are the precursors of the rains in South Africa. R. DEC. W.

RAINFALL MAP OF AFRICA.—The new rainfall map of Africa, shown at the meeting of the British Association last September by Dr. A. J. Herbertson and Mr. P. C. Waite, shows that the heaviest rainfall occurs around the Kamerun Mountains, where one station—Debunja—has an annual precipitation of about 400 inches, which is not much less than that of Cherrapunji, in the Khasi Hills of India, the record rainfall station of the world. The striking features of the map as a whole are (1) the belt of wet climate round the equator, broken by a drier area near, but not touching, the east coast; (2) the dry belts round the tropics, which do not extend quite to the east coast in the south; (3) the wet southwest and northwest corners; (4) the continuous wet area of varying width which fringes the east coast from Cape Colony to the equator. R. DEC. W.

CYCLONIC WEATHER CONTROL AT KIMBERLEY.—An interesting study of cyclonic control over the hourly normals of the more important meteorological elements at Kimberley is contributed by J. R. Sutton to the *Transactions of the South African Philosophical Society,* Vol. XVI, Pt. 2, Oct., 1905 ("On the Variation of the Hourly Meteorological Normals at Kimberley during the Passage of a Barometric Depression"). The number of separate cyclones studied is 105, and the hourly elements have been considered on the day on which the centre passed over, together with those on the day before and the day after. The depression does not in the least obliterate the ordinary diurnal variation of the barometer. The mean temperature of the first day is from one to two degrees higher than the normal; on the second day it is, on the whole, about 0.5° higher still, and on the third day it is between 3° and 4° lower than the normal. In front of the depression the range of temperature is increased; in the rear it is decreased; while along the trough it is not greatly affected. Such variation as there is in the amount of water vapour is more noticeable in the dryness following the trough than in the dampness preceding it.

There is a positive deviation in the amount of cloud during the second day, and a negative deviation on the third. Cirriform clouds are not much affected in quantity by the depression, the chief influence being in the cumulus and other low forms. In every 100 depressions, rain is observed in 30 on the first day, in 44 on the second, and in 27 on the third. The diurnal variation in wind velocity is evident during the passage of a depression, but the shape of the ordinary curve is considerably modified.

This study of Sutton's is in line with the growing effort to separate the *cyclonic* control of weather elements from the diurnal, monthly, and annual controls. Contributions towards the cyclonic control of rainfall have recently been made by Mill, and now comes this investigation from Kimberley, in which the cyclonic control of the other weather elements is considered. R. DeC. W.

Studying German East Africa.—The Commission for the geographical exploration of the German colonies has published the plan of work which it will endeavour to carry out. The first investigators whom it is sending to the field are Prof. Dr. K. Weule, whose headquarters will be at the station Kondoa-Irangi, on the western edge of the Masai Steppe, and Dr. F. Jäger, whose field is in the region of interior drainage between Mount Kilimanjaro and Victoria Nyanza.

AMERICA.

Contributions to the History of American Geology.—Over 500 pages of the *Annual Report* of the United States National Museum for 1904 are given to a work bearing this title by Dr. George P. Merrill, Head Curator of Geology in the Museum. It is a consecutive history of the rise and progress of American geology from 1785 to recent days. A part of it was first presented in a series of lectures to students in geology in Columbian University, Washington, though many of the facts were gathered later while looking up the records of the early Government surveys. The work Dr. Merrill has carried out is most desirable, and will be very useful. Such a history, if at all comprehensive, should show not merely what has been done and by whom and how it was done, but should also bring into clear light the gradual growth of the science and the development in geological observers of the power both of observation and deduction. This is what Dr. Merrill has done.

He calls attention to the errors and crudities of the early workers, but shows these pioneers also as men who had received little or no preliminary training in observation and deduction, who had access to very few books, and who had almost none of the information with which the geologist of to-day begins his career. Trained geologists, of course, know the story of the evolution of their science, but this history cannot fail to be of value and interest to younger students and the general public, who will see in this work "by what years of toil each new fact has been unearthed, cleansed of the débris which obscured its outlines, and treasured up in such form that it is now possible for the student in a few short years to encompass the garnerings of a century."

Many portraits of the long line of our geological workers are given, and also appendices showing the gradual development of the geological column as it appears in the principal text-books and biographical sketches of the leading workers in American geology. The index is copious.

LOCAL GLACIATION IN THE CATSKILLS.—It is a well-known fact that the elevation of the Catskills gives to them both a lower mean annual temperature and a greater rainfall than the lower parts of the State. Evidently, therefore, it is natural to expect that during the closing stages of the Ice Age local glaciation lingered in the higher mountain valleys after the icecap itself had disappeared. It has been shown that this was the case in other mountain regions in the eastern United States—the Adirondacks, Green and White Mountains, and Ktaadn, in Maine; and both Chamberlin and Smock have called attention to the probable existence of such glaciers in the Catskills. The first definite proof of this is brought forward by J. L. Rich (*Jour. Geol.*, Vol. XIV, 1906, pp. 113-121), who both describes and illustrates the clear evidence of local glaciation in the Flybrook valley, a tributary to Schoharie Creek. There are distinct concentric moraines in a cirque-like valley with enclosing mountains rising 3,360 to 3,448 feet above sea-level. Rich shows that they are concave upstream, proving local glaciation as contrasted with general, and that they merge upstream into descending lateral moraines. His evidence is convincing, and is an important contribution to the Pleistocene history of New York. It raises an interesting question here, as in other mountain regions of the East, as to the extent of this local glaciation. The answer ought not to be difficult, but, so far, it has not been given in this country. Judging from the facts discovered in the British Isles, we have reason to suspect that our Eastern mountains were important factors in the waning stages of the Ice Age, and in scientific study the present geography ought to determine this point. The Catskills offer an opportunity for such a study. R. S. T.

CLIMATIC FEATURES OF THE ICE AGE.—Prof. Albrecht Penck, in a recent number of the *Geographical Journal* (Feb., 1906, Vol. XXVII, pp. 182-187), presents an interesting discussion of the climatic conditions which led up to the Pleistocene Ice Age. His conclusion is that a rather slight decrease in the annual temperature—perhaps no more than 2°-3° C.—will suffice to cause an Ice Age if connected with a diminution of the summer temperature. The close parallelism of events now in progress in both the northern and southern hemispheres indicates a common origin both for recession of glaciers and desiccation of arid lands. This cause seems to be a very slight increase in temperature, thus increasing the ablation of glaciers and the evaporation in arid regions. The argument leading up to these conclusions is ingenious and convincing, but too long for presentation in a brief abstract. R. S. T.

COON MOUNTAIN'S SO-CALLED CRATER.—Messrs. D. M. Barringer and B. C. Tilghman have made an examination of Coon Mountain in Arizona, and the results of their work are published in the *Proceedings* of the Academy of Natural Sciences of Philadelphia (December, 1905). Coon Mountain or Butte rises above the plain about five miles south of Sunshine station in Coconino County, Arizona. The evidence collected has convinced the investigators that the "crater" was produced by the impact of an iron body falling out of space. The so-called mountain consists of a circular ridge from 130 to 160 feet in height, surrounding an almost circular depression in the earth varying from 3,600 to 3,800 feet in diameter and about 400 feet deep. Viewed from the inside the surrounding ridge is about 560 feet above the level of the crater bottom. As this hole has a general resemblance to a crater, some observers have surmised that it was really the crater of a long-extinct volcano. The rim around it, however, is not composed of volcanic outpourings; the hole penetrates strata of red sandstone, yellowish limestone, gray sandstone, and, finally, a brownish sandstone, in which it terminates. The writers dismiss as untenable the theory that this is a volcanic crater.

Another theory is that the hole was produced by a steam explosion; but the vast amount of steam required could be stored up only in regions of volcanic activity, and there is no evidence that this was ever such a region.

The writers believe the evidence to be overwhelming that the cavity was formed by the impact of a large meteorite. Much of the rock was ground by the collision into fine particles and almost impalpable dust, and a great part of the crater rim is formed of this débris. The colliding body itself was, to a large extent, broken into pieces. Borings have revealed small fragments and splinters of it, but no large piece has been found beneath the floor of the crater. On the other hand, several tons of meteoric iron have been collected around the crater. Seven pieces of it weigh from 600 to over 1,000 pounds each, and smaller pieces were found around the crater to a distance of two and a half miles. These iron specimens contain iron, nickel, iridium, and platinum, and there are millions of particles of it scattered far and wide around the crater. A shaft is now to be sunk in the centre of the crater, and, if possible, sufficient depth will be reached to demonstrate whether or not there are parts of the supposed foreign body buried several hundred feet beneath the central plain.

THE SAN FRANCISCO EARTHQUAKE AND FIRE.—Months will elapse before the earthquake which destroyed a large part of San Francisco on the morning of April 18 can be described in a satisfactory manner, but a brief statement of the event, and of the fire that followed it, may be made here in advance of the results of the investigations now in progress. These results will finally make it possible to publish the facts of special scientific interest.

The quick succession of severe earth movements that caused the destruction occurred about 5.15 A. M., and appears to have continued less than a half minute. The movement was apparently from south to north. Nearly all buildings were violently wrenched, and many of the frailer ones fell in ruins. Modern business buildings with steel frames stood the shock well, and remained practically intact in the vital points of their construction, though their facing of stone, to a greater or less extent, was toppled into the street. The satisfactory result of this very severe test of the efficacy of steel framework in large buildings will probably increase its use in cities where earthquake phenomena are common. Such architectural features as cornices suffered very severely, and many streets were blocked by débris. The loss of life appears to have been less than 300.

Seismographs reported the shock the world around. Many of the outlying towns in California suffered severely. The area within which the disturbance was sensibly felt, however, seems to have been much smaller than that which was within the range of the Charleston earthquake of 1886.

As is usual, fire followed closely after the shock. The water system was completely crippled, and there was no water to fight the flames. Beginning after the work of the earthquake, the fire did not completely burn itself out till April 23, five days after the shock. Approximately, seven square miles were burnt over, including the entire business district. The walls and steel framework of many buildings are still standing. In the course of a few days nearly 200,000 persons were able to leave the city to find temporary homes elsewhere. About the same number remained in the city, and the whole country participated in the effort to organize relief and get it to the sufferers as quickly as possible.

THE GEOLOGICAL SURVEY OF GEORGIA IN 1905.—At the beginning of the year, the large exhibit of the mineral resources of Georgia made by the State, through its Geological Survey, at the Louisiana Purchase Exposition in St. Louis, was returned to the Capitol and installed in the State Museum. W. S. Yeates, State Geologist, was largely engaged with administrative work. In field work, one of the assistant geologists completed a study of the contact between the Cretaceous and Tertiary formations along the line from Columbus to Macon and Augusta, preparatory to the completion of a preliminary map of the geology of Georgia. He was also engaged in field work on the iron ores of Georgia, so as to complete a second report on the iron ores of the State, to be published as *Bulletin* No. 10-B.

The edition of *Bulletin* No. 1, on the marbles of Georgia, having been exhausted, and there being continued demand for this report, additional data were procured in the field and a new edition, revised and enlarged, is now going through the press. The other Assistant Geologist began field work for a second report on the clays of Georgia, to be published when completed, as *Bulletin* No. 6-B. There are now in press *Bulletin* No. 13, on the ochre deposits; *Bulletin* No. 14, on the manganese deposits; *Bulletin* No. 15, on the underground waters of Georgia. A long report on the water-powers of Georgia has been submitted to the State Geologist by one of his assistants, and will be published as *Bulletin* No. 3-B.

HIGHEST MOUNTAINS IN THE UNITED STATES.—The fourth edition of the United States Dictionary of Altitudes gives new determinations of the heights of Mounts Whitney and Rainier. The elevation assigned to Mount Whitney is 14,502 feet, while in the third edition it was 14,898 feet (BULLETIN, 1905, p. 734). Mount Rainier's height is given as 14,363 feet, the earlier figures having been 14,526 feet. Mount Whitney leads in elevation among our mountains south of Canada, but Mount Williamson in California, according to the Dictionary, is only two feet lower. Colorado has twenty-seven mountains over 14,000 feet in height, very few of which are known by names to the general public excepting Pike's Peak, Holy Cross Mountain, and others which, owing to accessibility, history, or outlook, have especially attracted attention. Elbert Peak, 14,421 feet, is the culminating summit in Colorado. California has eleven mountains over 14,000 feet high. Eight of Alaska's summits rise above 15,000 feet, with Mount McKinley, 20,464 feet, and St. Elias, 18,024 feet, in the lead.

THE HUDSON BAY ROUTE.—Mr. A. P. Low, the newly-appointed director of the Geological Survey of Canada, addressing the Canadian Club at Montreal, declared that Hudson Bay and Hudson Strait were navigable for ordinary vessels for four clear months in the year—from July 15 to November 15. The distance from the Canadian wheat-belt to Fort Churchill was, he said, less than the distance to the head of navigation on the Great Lakes, while from Fort

Churchill to Liverpool the distance was the same as from Quebec to Liverpool. Therefore the shipping of grain from the North-West to Great Britain by the Hudson Bay route would save the heavy cost of transport from the Great Lakes to Quebec. Mr. Low expressed his conviction that this route would be utilized in the near future.

THE ROCKY MOUNTAINS PARK OF CANADA.—The *Report* for 1905 of Superintendent Douglas, of the Rocky Mountains Park of Canada, shows that considerable additions were made to the roads and bridle trails, opening new points from which to view the splendid scenery of this great national park. About 5,000 tourists were turned away from Banff last season for lack of accommodations. The hotels are excellent, and a number of them are being enlarged to meet the increasing demands of the tourist season. The discovery of the Deutschman caves, about six miles from Glacier House, apparently adds a new attraction to the great playground. About four-fifths of a mile of passageways have thus far been surveyed in the Cañon, the main cave, the descent into which was made last year by a rope down a nearly perpendicular incline. The average height of the main passage is about 100 feet, with a width of from 8 to 20 feet. The cave was formed by water-erosion in very hard crystalline limestone consisting of alternate bands of white mottled and grey marble. A carbonate-of-lime coating on the walls forms its decoration. It is estimated that the erosion of this cave required a period of nearly 40,000 years. Only a part of the cave has yet been explored, and a great deal of work must be done before this and other caverns in the group are made accessible to the general public.

EARTHQUAKE IN SOUTH AMERICA.—On the last day of January the western coast of Colombia and adjacent portions of Ecuador were the scene of intense seismic activity. Scientific details have not been received, but it is known that the shock was first felt in the province of Esmeraldas, Ecuador, at 10 A. M., and the disturbance was frequently repeated until Feb. 6, the inhabitants living in a state of panic and abandoning their houses for the open air. The epicentral tract was apparently the sea-floor some distance from the land. Waves caused by the shocks swept in, flooding the principal streets of Esmeraldas, while Tumaco, a small Colombian island, was overwhelmed, many persons being drowned. Near Port Limones four small islands are said to have disappeared, though the fishermen there had time to escape in their boats. Various buildings in Esmeraldas were overthrown and many Colombian towns were severely shaken, the damage and loss of life being apparently greatest at Mosquera, San Juan, and Domingo Ortiz, while Antioquia and other departments suffered severely.

Professor John Milne reports that he obtained an excellent series of seismograms at his observatory on the English coast, indicating an unusually large collapse. He says (*Geog. Jour.*, April, 1906) that in the history of seismic disturbance in this region it is remarkable how often convulsions in the Cordillera have found a response in the West Indies. To go no further back than 1902, the great disaster at St. Pierre had been preceded by severe disturbances in Guatemala. A record of cable fractures off the west coast of South America shows that the portion of the sea-floor off the mouth of the Esmeraldas River has been particularly liable to changes of contour.

GEOGRAPHICAL DICTIONARY OF THE DEPARTMENT OF CHUQUISACA, BOLIVIA.—The Geographical Society of Sucre has issued a gazetteer of this political subdivision of Bolivia in which Sucre is situated. The *Diccionario de Chuquisaca* contains 372 pp., well printed, with the names arranged in alphabetical order and the geographical, historical, and statistical data relating to each topic. The introduction gives a summary of the orography and hydrography of the Department, the physical geography is further treated under the name of each canton, and the environs of each of the larger towns are described in detail. The range of geographical topics is wide enough to include the haciendas or landed estates.

ARGENTINE SCIENTIFIC STATIONS IN THE FAR SOUTH.—A cable despatch from Buenos Aires says that the Argentine Government has purchased the polar ship of the Charcot Expedition, renamed it *Le Français,* and will utilize the vessel to keep up communications with the meteorological and magnetic station founded by Mr. Bruce in the South Orkneys. The Government intends to establish an Antarctic scientific station on Wandel Island, Charcot's winter quarters.

ASIA.

THE KANGRA EARTHQUAKE OF APRIL 4, 1905.—The *General Report* of the Geological Survey of India for 1905 (*Records,* Vol. XXXIII, Part 2, 1906) contains a review of the destructive earthquake that devastated the Kangra valley last year, among the foothills of the Himalayas in the eastern part of the Punjab. For the more critical study of the effects, four officers of the Geological Survey were detailed to the affected areas. The destruction of life in the epicentral tract was enormous, as the earthquake began with little warning at an early hour, when most persons were still asleep. Almost all the buildings in the Kangra area were destroyed, there was great damage and considerable loss of life in the hilly tracts of Mandi State and Kulu, serious damage in Dehra Dún, Mussoorie, Chakráta, and other towns, and slight damage in the large towns of Lahore, Amritsar, Jullundur, Sahâranpur, and others similarly placed with reference to the centre of disturbance. Far outside these regions the effects were felt with constantly-diminishing intensity, until the limits of its appreciation by the unaided senses coincided roughly with part of an ellipse passing through Quetta, Surat, Ellichpur, False Point, and Lákhimpur. This curve, if continued, would pass into the little-known regions of the higher Himalaya and Tibet. It is believed that the total area affected was about 1,625,000 square miles. The earthquake was therefore a notable one in seismological history; and as 20,000 persons are estimated to have perished by it, it was one of the most disastrous of modern times.

These points were noticed with regard to the surface effects. All the surface valley deposits (alluvium, etc.) were proportionately more shaken than the solid rock; the soft Tertiary sandstones were thrown into more destructive vibrations than the older and more compacted strata; narrow ridges with free ends (spurs) were very much more shaken than broad areas and the flat hollows between the spurs; the more distant vibrations and tremors were weakly felt in alluvium, in the flat-lying Vindhyans and the Deccan trap, while no results were reported from the ancient and steeply-dipping Aravalis, and this area was similarly barren of results in the earthquake of 1897. The earth-waves travelled to Japan at the rate of 2.05 miles a second. There were two foci of the disturbance. The main focus was in the Kangra area parallel with the folded Tertiary rocks, and its depth was about 18 to 30 miles. The subsidiary focus was parallel to the first under the Tertiary mass in the Dehra Dún area.

DR. SVEN HEDIN'S JOURNEY THROUGH PERSIA.—A telegram from Teheran, dated April 10, announced the arrival of Dr. Sven Hedin in Seistan on the previous day after an extremely interesting journey by Jandak, Turoot, Khur, Tabbas, Naiband, and Neh, in the course of which he crossed the Dasht-i-Kavir, the great salt desert, three times. The explorer said he was in splendid health, and had collected material for a work on eastern Persia. He had made a map of 162 sheets, had taken hundreds of photographs and sketches, and had formed a geological collection. He was to leave for Nushki on April 12.

EXPLORATIONS IN THE TARIM BASIN.—According to the Paris correspondent of the London *Times,* the Paris Société de Géographie has entrusted to Mr. Peliot, a young French Professor of the Chinese language, a scientific mission which will comprise explorations in the country north of Tibet where Sven Hedin, Stein, and others have found ruins bearing witness to a flourishing ancient civilization. The Société has supplied about 200,000 francs to be used in his work.

A 300-YEAR CLIMATIC CYCLE IN CHINA.—In a recent number of *Nature* (Vol. 73, 1906, 413-414) a correspondent in Shanghai, Mr. T. W. Kingsmill, points out that a study of droughts in China reveals a periodicity of about 300 years. This period has lately been discussed by Mr. H. W. Clough in the *Astrophysical Journal,* who arrives at the conclusion that a 300-year cycle exists in solar and in allied terrestrial phenomena. Mr. Kingsmill notes that the climatic cycle of about thirty-four years (Brückner) seems to agree with three sun-spot cycles, while the longer period of 299¼ years seems to correspond with twenty-seven sun-spot cycles. R. DEC. W.

AUSTRALASIA.

RAINFALL MAP OF NEW SOUTH WALES.—The Sydney, New South Wales, Observatory has published a mean annual rainfall map of the colony. At each station the mean annual rainfall is down in inches and hundredths, and, in addition, the usual isohyetal lines are drawn for every five inches. The annual means are computed from all yearly records available, covering generally from twenty to forty years. There is, therefore, no reduction to the same period of time; but although the map is doubtless to some extent misleading on that account, the larger facts are shown with sufficient accuracy for ordinary purposes.

R. DEC. W.

SNOWSTORM OF AUGUST, 1905, IN NEW SOUTH WALES.—The Observatory at Sydney, New South Wales, has published an interesting chart showing the extent of a snowstorm on August 29th and 30th, 1905. Every station at which snow fell is indicated by a small circle. This snowfall, as is pointed out by Mr. Henry A. Hunt, Acting Meteorologist of the Sydney Observatory, was somewhat remarkable, in that it reached a very low latitude late in the season. In the English translation of Hann's *Handbuch der Klimatologie,* Vol. I, p. 314, the equatorial limit of occasional snowfall in Australia is given as latitude 34° S., and on page 313 the statement is made that snow has fallen once at Sydney. In the snowstorm of August 29th and 30th last, snow is noted as having occurred at Hanover, in latitude about 29.1° S. R. DEC. W.

EUROPE.

THE MARSEILLES EXHIBITION.—The oceanographical exhibition which has been in preparation for some time at Marseilles will be opened to the public between

April and October. The exhibits will especially illustrate the results of deep-sea exploration and of the recent researches in the polar regions. All matters connected with the scientific study of the sea and its fisheries will be shown. The exhibition will have an international character, and the co-operation of the leading oceanographers of all nations was invited. The principal institutions in Great Britain connected with the study of oceanography and marine biology organized a Committee under the presidency of Sir John Murray, and a representative British exhibit has been sent to Marseilles. The polar exploring vessel *Scotia* will be on exhibition, and also a model of Captain Scott's ship *Discovery.* In September the French Colonial Congress will be held in connection with the exhibition, and a Congress of geographical societies will also be arranged under the presidency of M. le Myre de Vilers, President of the Paris Société de Géographie.

RAINFALL OF ENGLAND AND SOUTHEAST TRADE VELOCITY.—Dr. W. N. Shaw, Director of the British Meteorological Service, has made a study of the connection between English rainfall and the velocity of the southeast trade at St. Helena (*Nature,* Dec. 21, 1905). In these days, when more and more evidence is accumulating of a correlation between the variations of one meteorological element in one region and the variations of quite another meteorological element in a very different region, one is not surprised at the results of Dr. Shaw's investigation; but the conclusions are wholly new, and very interesting. The year 1903 was one of exceptionally high trade-wind velocity; it was also a year of heavy rainfall in England. The year 1893 was one of drought in England; it was one of very low wind velocities at St. Helena. When the monthly values of wind velocity at St. Helena for the whole period are plotted (1892-1903), and together with these the seasonal rainfall in the south of England, there is a remarkable similarity in the curves. In 1898 there were two maxima of wind velocity, instead of the usual one maximum, and the rainfall of southern England also showed two maxima; the first, in May, two months after the unusual second maximum of wind velocity at St. Helena; the second in November, a month later than usual, and the second maximum of wind velocity at St. Helena was also a month later than usual. The evidence in favour of a connection between St. Helena trade-wind velocities and south England rainfalls can, Dr. Shaw believes, "hardly be pure coincidence." R. DEC. W.

A COMPARATIVE STUDY OF SCOTTISH AND DANISH LAKES.—Dr. Wesenberg-Lund of the Danish Fresh-water Biological Station was invited in 1904 by Sir John Murray to spend a few weeks in exploring the Scottish lakes, in order to make a comparison between them and the Danish lakes. In other words, he desired to compare the lakes of a highland with those of a lowland country. He has written a paper on the results of these studies (*Proc.* of Roy. Soc. of Edinburgh, Vol. XXV, Part I, pp. 401-48, with four plates). The following are some of his conclusions as to the physical characteristics of the lakes:

> The foregoing remarks refer only to the character of the Danish and Scottish lakes, but I feel convinced that many of the facts stated are common to lakes belonging respectively to the great Central European plain and to alpine countries. As traits common to all the first-mentioned lakes, I would specially point to their shallowness, their gently sloping shores, their roundish outline, the high temperature of the surface water in summer and the freezing over in winter, the ice-erosion on the shores. the small transparency, and the yellow or yellow-green colour of the water in summer, due to the huge plankton-masses. Differences may be looked for with regard to the chemical composition of the water and bottom-mud, owing to the varying chemical compositions of the soil in different countries; I anticipate that further investigations will prove that the large amount of lime carried by streams into

our lakes is one of the most characteristic peculiarities of the Danish lakes. On the other hand, I am of opinion that the features mentioned in connection with the Scottish lakes are common to alpine lakes in general. Especially would I call attention to their great depth and long and narrow form, their precipitous shores, the sudden flooding of the rivers and the rapid changes in the level of the lakes, and the slight amplitude in the annual variation of the surface temperature. Peculiar to the Scottish lakes are the small transparency and yellowish-brown colour of the water, to which may undoubtedly be added the large amount of humic acid. These peculiarities may be traced to and are closely connected with the strongly climatological and geological conditions common to the whole country.

(A Comparative Study of the Lakes of Scotland and Denmark. By Dr. C. Wesenberg-Lund of the Danish Fresh-water Biological Station, Communicated by Sir John Murray. Proceedings of the Royal Society of Edinburgh, Vol. XXV, Part 1, p. 411.)

CLIMATE OF THE FAROE ISLANDS.—The Faroe Islands lie in the course of the Gulf Stream and but a short distance from the edge of the cold polar current which sweeps around the east coast of Iceland. Hence the climate is variable and uncertain, although the ranges are small. The summers are cool and the winters mild. At Thorshavn the January mean is given as 37.8°, and the July mean as 51.4°. In twenty-five years the absolute extremes were 11.1° and 70.1°. Fog is most common in summer. Clear days are always rare. If a clear day is taken as one with not more than one-fifth of the sky cloudy, there are at Thorshavn, on the average, only six clear days a year. Most of the rainfall comes in autumn and winter, as usual in a marine régime of rainfall. Snow rarely lies more than a week or so near the shore. In some localities it may gather on the slopes and cause avalanches.—(*Scot. Geogr. Mag.*, XXII, 1906, 63.)

R. DeC. W.

ALPINE MUSEUM IN BERN.—The Alpine Museum which was opened in Bern last year has among its exhibits the superior relief models of the Swiss Alps by Professor Heim and engineer Simon and the finest specimens of Swiss Alpine cartography, as the great Dufour maps and the modern relief maps. Many exhibits illustrate the Alpine fauna and flora, methods of rescue in accidents, models of club huts, geological specimens, the development of the mountaineering outfit, Alpine pictorial art, etc. The Museum is under the direction of a Commission, and it will publish "Wissenschaftliche Mitteilungen," of which the first number, "Das Alpine Rettungswesen der Schweiz," by Dr. W. Kürsteiner, has appeared.

THE CINEMATOGRAPH IN EXPLORATION.—Ethnological expeditions are beginning to use the cinematograph, and are finding it a very helpful appliance. The Seligmann Expedition, which recently returned from British New Guinea, brought photographic representations not only of the natives posed in groups but also of the natives in movement. These moving pictures show native dances and other phases of recreations, ceremonies, and occupations. Dr. A. C. Haddon, commenting on Dr. Seligmann's illustrated lecture before the Royal Geographical Society, said that he had seen many of these dances, and it was extremely interesting to him to see them again on the screen, but he missed the colour, the noise, and the excitement which accompany them. The hope was expressed that scientific societies would encourage the use of this method of depicting life among savage peoples.

THE NINTH INTERNATIONAL GEOGRAPHICAL CONGRESS.—The Committee on Organization appointed by the Geographical Society of Geneva has chosen Dr. Arthur de Claparède as President of the Ninth Congress, which will meet in that city July 27—Aug. 6, 1908.

AWARDS OF THE ROYAL GEOGRAPHICAL SOCIETY.—The Council of the Royal Geographical Society has awarded the medals and other honours for 1906 as follows: The Founder's Medal to Mr. Alfred Grandidier for the results of his many years' work on the island of Madagascar; the Patron's Medal to Dr. Robert Bell, who, during forty-five years of field work, mapped a large area of unknown Canada; the Victoria Research Medal to Professor W. M. Ramsay for his studies and field work in ancient geography during nearly thirty years; the Murchison Award to Major H. R. Davis for his explorations in the Shan States, Kachin Hills, Yunnan, Siam, and Sechuan; the Gill Memorial to Major A. St. Hill Gibbons for his exploring and survey work in Barotseland on his two expeditions of 1895-96 and 1898-1900; the Cuthbert Peek Fund to Major H. H. Austin for explorations in the Lake Rudolf and Sobat regions and other work; and the Back Bequest to Major R. G. T. Bright for his eight years of explorations in the Sudan, Uganda, and East Africa.

THE SIMPLON TUNNEL.—The Simplon Tunnel will be opened to public traffic on June 1 next. The first passenger train went through the tunnel on the 25th of January. It consisted of a locomotive and four cars. Entering the tunnel at Brig at 8.46 A. M., it reached the station at the south end of the tunnel at 9.33 o'clock.

OCEANOGRAPHY.

THE PRINCE OF MONACO'S CAMPAIGN LAST YEAR.—Prince Albert of Monaco has printed a brief report on the seventh scientific campaign of the *Princesse Alice* (*Comptes rendus de l'Académie des Sciences,* March 12, 1906; reprinted as *Bulletin* 69 of the Musée Océanographique de Monaco). His voyage was to the Sargasso Sea in the mid-Atlantic, the chief purposes being to study the deep-sea fauna and that of the Sargasso Sea and the meteorology of the upper air. One hundred and eighteen soundings were made to a depth of 5,580 meters, and many specimens of the sea-floor were secured. The vessel returned to Marseilles on September 24, after a voyage of sixty-four days. Most of the report is given to an account of the fauna obtained, which included some rare and new species. The life of the Sargasso Sea was studied at the surface, middle depths, and on the sea-floor at a depth of 3,465 meters. The animal life amid this vegetation is numerous, but not remarkably varied. Specimens of Actinozoa, Ascidiæ, Nudibranchiata, crabs, isopods, fish, and a few other animals were obtained. A tendency to mimicry is particularly noteworthy among the Sargasso fauna. While in this sea five swallows (*Hirundo rustica erythrogaster* Bodd, American variety) visited the vessel, though it was distant nearly 900 miles from the nearest continent. The Prince calls attention to the absence of nearly all animal life at the surface of the sea in all the regions swept by the trade-winds between the Tropic of Cancer, the Azores, and Africa. In this region he has never seen whales or sea-fowl. Flying fish and plankton alone animate this desert. Twenty-six balloons were sent up for meteorological records and thirteen kites, and an altitude of 16,000 meters was attained.

NOTES.

Dr. Fridtjof Nansen, who was appointed Norwegian Minister at London, last November, has been raised to the rank of Ambassador.

Professor Albert P. Brigham, of Colgate University, will conduct a geological course at the summer school of the University of Wisconsin this season.

Miss Ellen C. Semple, of Louisville, will lecture on Anthropology at the University of Chicago during the summer term.

Professor Henry J. Cox, of the U. S. Weather Bureau Service, has been elected President of the Geographic Society of Chicago, to succeed the retiring President, Dr. Paul Goode.

The Geological and Natural History Survey of Wisconsin is publishing a report by Professor U. S. Grant on the lead-and-zinc region of south-western Wisconsin. It contains a general geological map of the region and nine large-scale topographical and as many geological maps of the more important mining areas in the district.

Dr. O. C. Farrington, of the Field Museum of Natural History, is giving a series of lectures on "Meteorites," at Walker Museum, University of Chicago, on Wednesday afternoons in April and May. His subjects are: (1) "History and Astronomical Relations"; (2) "Phenomena of Fall, Size, Shape and Distribution"; (3) "Structure and Classification"; and (4) "Composition and Terrestrial Relations."

Professor T. C. Chamberlin, of the University of Chicago, gave an address on May 11 before the Geographic Society of Chicago on "Seculai Changes in Climate."

The Geographical Society of Philadelphia held its annual dinner on April 21. Among the guests of the Society on that occasion were Professor Libbey, Admiral Melville, Dr. Willis L. Moore (Chief of the Weather Bureau), and Mr. Gilbert H. Grosvenor.

Among the French explorers who by decrees of March 9 and 12 were named for decorations in the Legion of Honour were Gautier (Sahara), Le Chatelier (Sahara, Sudan, Congo), De Flotte de Roquevaire (Morocco), L. Gentil (Morocco), Mehier de Mathuisieulx (Tripoli), Rabot (Greenland, Lapland), Lenfant (Niger, Chad), and Superville (Ubangi).

An atlas of European History, containing some forty-eight maps, has been published through Holt & Company.

U. S. BOARD ON GEOGRAPHIC NAMES. DECISIONS, APRIL 4, 1906:

BIG PUCKETA: creek, Allegheny and Westmoreland counties, Penn. (Not Big Pucketta, Paucatoes, Pocatoes, Poketo, Pucketta, Poccatoes, nor Puckety.)

CAMP HAGERMAN: railroad station and town, Warren county, Ohio. (Not Hageman.)

CHATAHOSPEE: creeks (Big and Little) tributary from the east to Tallapoosa river, Chambers and Tallapoosa counties, Ala. (Not Chattahospee, Hoolethlocco, Hoolethloces, Hoolethloco, nor Hootethlocco.)

ELLICOTT CITY: county seat, Howard county, Md. (Not Ellicott nor Ellicotts Mills.)

FLATHEAD: river, Flathead county, Montana, and in Canada. (Not Flathead River North Fork nor North Fork Flathead.)

KEARNY: town, Hudson county, N. J. (Not Kearney.)

KENAI: stream, draining Lake Shilak, Kenai peninsula, into Cook inlet, Alaska. (Not Kaknu.)

MEADOW: mountain, Warren town, Knox county, Me. (Not Congress.)

MEGUNTICOOK: lake, Camden town, Knox county, Me. (Not Canaan nor Lincolnville.)

NORTH AOWA: north branch of stream, Dixon county, Neb. (Not Agoway, Aowa, Ayowa, Iowa, nor Ioway.)

NUTTEN HOOK: village, Columbia county, N. Y. (Not Coxsackie, Newton Hook, nor Nuttenhook.)

*PRINCE GEORGES: county, Md. (Not Prince George nor Prince George's.)

QUEEN ANNE: county, Md. (Not Queen Ann, Queen Anne's, Queen Ann's, nor Queen Anns.)

REIDS GROVE: railroad station and village, Dorchester county, Md. (Not Reed's Grove, Reeds Grove, Reedsgrove, nor Reid's Grove.)

ST. GEORGE ISLAND: election precinct and island, St. Marys county, Md. (Not St. George's Island nor St. Georges Island.)

*ST. MARYS: city, county, and creek, St. Marys county, Md. (Not St. Mary nor St. Mary's.)

SCUPPERNONG: river, Jefferson and Waukesha counties, Wis. (Not Schupernong nor Scupernong.)

*TENANTS HARBOR: lighthouse and village, Knox county, Me. (Not Tenant's Harbor, Tennant Harbor, nor Tennant's Harbor.)

COLORADO.

BISON MOUNTAIN: Tarryall mountains, Park county.

BLACK MOUNTAIN: Park county. (Not Basaltic.)

BUFFALO PEAK: Tarryall mountains, Park county. (Not Freemans.)

CATHEDRAL PEAKS: West Elk mountains, Gunnison county. (Not Mendicant ridge.)

CRESTONE PEAKS: Sangre de Cristo range, Saguache county. (Not Three Tetons.)

DEL NORTE PEAK: San Juan mountains, Rio Grande county. (Not Pintada.)

ELECTRIC PEAK: Sangre de Cristo range, Custer county.

GRANITE BUTTE: group of hills, Teller county. (Not Catamount hills.)

GREEN MOUNTAIN: on plains at base of Front range, Jefferson county. (Not Hendricks peak nor Mt. Hendricks.)

GREENHORN MOUNTAIN: Wet mountains, Huerfano county. (Not Cuerno Verde.)

HUNTS PEAK: Sangre de Cristo mountains, on the boundary between Saguache and Fremont counties.

KIT CARSON PEAK: Sangre de Cristo range, Custer and Saguache counties. (Not Frustum.)

MESA MOUNTAIN: Saguache county. (Not Del Norte.)

MOUNTAIN PRINCETON: Sawatch range, Chaffee county. (Not Chalk.)

MOUNT SNEFFELS: San Juan mountains, Ouray county. (Not Mount Blaine.)

MUSIC PASS: Sangre de Cristo range, Custer county.

OHIO PEAK: Elk mountains, Gunnison county. (Not Anthracite.)

OUTRAY PEAK: Sawatch range, Chaffee county. (Not Hump mountain, Mount Ouray, nor Ouray mount.)

PURPLE MOUNTAIN: Elk mountains, Gunnison county.

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* Reversal of former decision.

SADDLE MOUNTAIN: Park county. (Not Quadrate.)

SHAVANO PEAK: Sawatch mountains, Chaffee county. (Not Mount Shavano nor Mount Usher.)

SIERRA BLANCA MOUNTAINS: Sangre de Cristo range, Costilla county. (Not Cerro Blanco.)

SIGNAL BUTTE: Teller county. (Not Cheops pyramid.)

THUNDER BUTTE: Douglas county. (Not Christs.)

TOPAZ MOUNTAIN: Tarryall mountains, Park county. (Not Pyramid.)

TRACHYTE KNOB: Teller county. (Not Iron knoll nor Iron mountain.)

TROUT CREEK PASS: Trout Creek hills, between Chaffee and Park counties. (Not Bath, Summit, nor Trout.)

TURKSHEAD PEAK: Front range, Jefferson county. (Not Turkey Head, Turkeyhead, nor Turks Head.)

VIRGINIA PEAK: Front range, Jefferson county. (Not Craigs.)

President Roosevelt has ordered that there be added to the duties of the United States Board on Geographic Names the duty of determining, changing, and fixing place-names within the United States and insular possessions, and that all names hereafter suggested for any place by any officer or employee of the Government shall be referred to that Board for its consideration and approval before publication. In these matters, as in all cases of disputed nomenclature, the decisions of the Board are to be accepted by the Departments of Government as the standard authority.

AMERICAN GEOGRAPHICAL SOCIETY.—TRANSACTIONS, APRIL, 1906.—A Regular Meeting of the Society was held at Mendelssohn Hall, No. 119 West Fortieth Street, on Tuesday, April 17, 1906, at 8.30 o'clock, P. M.

Mr. Levi Holbrook in the chair. The following persons, recommended by the Council, were elected Fellows:

Ellsworth M. Taylor.
Joseph B. Morrell.
George Oxenbridge Thacher.
Frank B. Taylor.
C. C. Leffingwell.
Fritz B. Talbot.
Alfred Holt Stone.
Herman K. Viele.
James Slater.
Henry B. Tindall.
T. C. Trask.
Frederick Richardson Griffith.
Edward S. Toothe.
Edgar A. Weimar.
Samuel H. Wheeler.
Richard H. Williams.
John Y. Bayliss.
Mahlon A. Winter.
Charles Addams Worrall.

The Chairman then introduced Mr. Howard W. Du Bois, who addressed the Society on A Mining Engineer's Reconnaissance in the Canadian Rocky Mountains. Stereopticon views were shown.

On motion, the Society adjourned.

ERRATA for article on *Glaciers and Glaciation of Yakutat Bay, Alaska,* Vol. XXXVIII, 1906, pp. 145-167:

p. 146, first foot-note, second line, change *desires* to *deserves.*

p. 150, last line, second paragraph, change 14 and 15 to 13 and 14.

The numbers and legends for figures 23 and 24 have been placed under the wrong half-tone. These should be transposed.

On the map, proof of which was not seen by the authors, *Yakutat Country* should read *Yakutat Cemetery*. *Galiado Glacier* should read *Galiano Glacier.*

As originally written, this paper had a section describing a recent remarkable change of level, which occurred in September, 1899. The elevated and depressed shore-lines were indicated, to illustrate this part of the paper, which was not printed. An account of this change of level will appear in a forthcoming number of Volume XVII of the *Bulletin* of the Geological Society of America.

NEW MAPS.

AFRICA.

CONGO FREE STATE.—Mission Scientifique Congo-Nil. Itinéraire Parcouru d'Octobre, 1902, à Avril, 1905. Scale, 1:1,000,000, or 15.7 statute miles to an inch. By Commandant Ch. Lemaire and Lieutenants A. Paulis and A. Caroelli. Issued by the Congo Free State, 1900.

The map gives the route of the Lemaire Expedition between the Congo and the Nile, shows the points whose longitude was determined, and the methods used, together with the villages, camps, mountains, and the altitudes measured.

FRENCH CONGO.—Le Tchad. Aspect général en fin Avril, 1904. Scale, 1:400,000, or 6.3 statute miles to an inch. By Captain J. Tilho, *La Géographie,* No. 3, Paris, 1906.

This very detailed map of the lake is based upon the surveys of six French officers during the French explorations of February-May, 1904. A number of new points were astronomically fixed, and the map is the best yet made of this lake, now far advanced toward desiccation. The scores of sand-banks which have arisen as little islands along the east coast are shown, and there are lines of soundings giving the depth of water in various parts of the lake.

EGYPT.—Carte des Chemins de L'État et des Compagnies agricoles. Scale, 1:400,000, or 6.3 statute miles to an inch. (2 Sheets.) Bureau des Études, Cairo, 1905.

Shows in black the single and double track Government and three private railways and in red the lines of the two companies operating the Delta and Fayum Light Railways. The neighbouring desert routes are indicated. The name of every railroad station from the Mediterranean to Assuan is inserted, and there are insets of Cairo, Alexandria, and their environs on a scale of 1:100,000, or 1.5 statute mile to an inch.

AMERICA.

U. S. GEOLOGICAL SURVEY MAPS.

Geologic Atlas of the United States. Washington, D. C., 1906.
No. 131. Needle Mountain Folio, Colorado. Scale, 1:62,500.
No. 132. Muscogee Folio, Indian Territory. Scale, 1:125,000.
No. 133. Ebensburg Folio, Pennsylvania. Scale 1:62,500.